

Ch 4 Matrices

4-1 Intro to Matrices

Matrix--a rectangular array of variables or constants in horizontal rows and vertical columns, enclosed in brackets.

$$A = \begin{bmatrix} 3 & 2 & 1 & -2 \\ 5 & -4 & 6 & 11 \\ -4 & 9 & 0 & 1 \end{bmatrix}$$

Each value is called an element.

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How are matrices used to make decisions?

Sabrina wants to buy a sports-utility vehicle (SUV). There are many types of SUVs in many prices and styles. So, Sabrina makes a list of the qualities for different models and organizes the information in a matrix.



Base Price	Horsepower	Towing Capacity (lb.)	Cargo Space (cu ft.)	Fuel Economy (mpg)
Large SUV \$32,450	285	12,000	46	17
Standard SUV \$29,115	275	8700	16	17.5
Mid-Size SUV \$27,975	190	5700	34	20
Compact SUV \$18,180	127	3000	15	26.5

Source: Car and Driver Buyer's Guide

When the information is organized in a matrix, it is easy to compare the features of each vehicle.

The matrix to the right from p.154 in your text shows the organization of different SUVs.

4

How many rows are there?

5

How many columns are there?

Row matrix--only one row $[3 \ 5 \ -2]$

Column matrix--only one column $\begin{bmatrix} 0 \\ -8 \end{bmatrix}$

Square matrix--same number of rows as columns

Zero matrix--every element is zero

$$2 \times 3 \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

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Equal Matrices--same dimensions; each element is = to the corresponding elements

$$\begin{bmatrix} 4 & 3 & 7 \\ -2 & 6 & 1 \end{bmatrix} = \begin{bmatrix} 4 & 3 & 7 \\ -2 & 6 & 1 \end{bmatrix}$$

2×3 3×2

$$\begin{bmatrix} 4 & 3 & 7 \\ -2 & 6 & 1 \end{bmatrix} \neq \begin{bmatrix} 4 & -2 \\ 3 & 6 \\ 7 & 1 \end{bmatrix}$$

2×3 3×2

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Solving equations involving matrices

Examples:

The following 2×2 matrices are equal.

$$\begin{bmatrix} 8 & -10 \\ 2y & 24 \end{bmatrix} = \begin{bmatrix} x+3 & z \\ 7 & 24 \end{bmatrix}$$

$$x = 5$$

$$z = -10$$

$$y = 3.5$$

The following 2×1 matrices are equal.

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} y-9 \\ 2x+13 \end{bmatrix}$$

$$(-4, 5)$$

$$x = y - 9$$

$$y = 2x + 13$$

$$x = 2x + 13 - 9$$

$$-x = 4$$

$$x = -4$$

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WEATHER For Exercises 8 and 9, use the table that shows a five-day forecast indicating high (H) and low (L) temperatures.

8. Organize the temperatures in a matrix.

9. What are the dimensions of the matrix?

Fri	Sat	Sun	Mon	Tue
H 88	H 88	H 90	H 86	H 85
L 54	L 54	L 56	L 53	L 52

2×5

$$\begin{array}{l} \text{High} \\ \text{Low} \end{array} \begin{bmatrix} \text{F} & \text{Sa} & \text{Su} & \text{M} & \text{T} \\ 88 & 88 & 90 & 86 & 85 \\ 54 & 54 & 56 & 53 & 52 \end{bmatrix}$$

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Homework

p156-157

10-16, 18-21, 25-27

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